Statement to the Governor's Task Force on Efficiency and Renewables

June 15, 2004, State Capitol Room 411 South

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SUGGESTIONS REGARDING RURAL ENERGY INITIATIVES

The Department of Agriculture, Trade and Consumer Protection should do the following:

(a) Stop the loss of Wisconsin farmland by promoting energy from biomass.
(b) Assess the availability of agricultural and forest residues.
(c) Inventory land acreage suitable for tree crops based on soil conditions, access to the electrical grid, and transportation corridors;
(d) Facilitate opportunities for biomass-fired combined heat and power (CHP) applications;
(e) Sponsor a demonstration 160 acre tree farm for fast growing hybrid poplar and cottonwoods.

■ *STOP LOSS OF FARMLAND, PROMOTE ENERGY FROM BIOMASS*

Wisconsin is losing farmland at the rate of 130,000 acres per year, and over the last 10 years we have lost 1.3 million acres (1) due in part to growth of urban areas but primarily due to sell-off of farm acreage piecemeal to non-farmers as farmers strive to supplement their income. This loss of farmland represents the lost opportunity for two 100 MW bioenergy power plants per year operating at a 60% capacity factor. The 1.3 million acres lost in the last 10 years represents the potential for about 12% of the electrical power generating capacity in Wisconsin.

Corn, soybeans, and other crops are grown in excess sustained by federal price supports. Farmland is producing a surplus of food and feed. We need the excess farmland to grow energy crops for renewable electrical power, process heat and transportation fuels. The decline of the US natural gas and oil supplies, unrest in the Middle East, and global climate change considerations are providing new uses and new opportunities for farmland. We cannot afford to lose more farmland.

Dedicated crops of fast growing trees and switchgrass offer the most important renewable source of power and fuel. Biogas, landfill gas, agricultural residues, and forestry and paper residues are also important sources of renewable energy. Biogas and landfill gas developments are already moving forward. The use of residues and dedicated energy crops needs to be promoted.

■ *ASSESS AGRICULTURAL AND FOREST RESIDUES*

Agricultural residues such as corn and sorghum stover and various straws are candidates

for cofiring in pulverized coal power plants and as a fuel feedstock. There may be other agricultural residue opportunities in Wisconsin, but high moisture content and low bulk density are limiting factors. The Department should conduct an assessment of the amount, distribution, suitability, and cost for removal and transportation of these residues. Similarly forest residues of trimmings left in the woods should be included in the assessment. The results of the assessment should be made available to emerging biopower and biorefinery industries.

■ *INVENTORY THE LAND SUITABLE FOR DEDICATED ENERGY CROPS*
As of 2002 Wisconsin had 15.9 million acres of farmland. If 10% of this land were converted to energy crops then 8 million dry tons of biomass representing 2,500 MW of electric power at a 60% capacity factor could be generated, or about 15% of Wisconsin's current installed generating capacity. In addition perhaps some of the 1.3 million acres lost during the last 10 years can be converted to energy crops.

The Department should identify the land acreage in the State suitable for tree farms and switchgrass based on soil conditions, access to the electrical grid, and transportation corridors. This information is needed to facilitate planning in a more systematic way for the growth of biopower and biorefinery industries in Wisconsin.

■ *IDENTIFY COMBINED HEAT & POWER OPPORTUNITIES*
Combined heat and power (CHP) plants achieve 80% overall efficiency where space and process heating loads are present. There are significant CHP opportunities in the food processing and greenhouse industries, in making fuels and chemicals from biomass, and in providing power and heat for new industrial parks. The Department needs to identify and promote these opportunities where biomass can be used.

Recent developments in Sterling engines should also be factored into the planning process. Exciting new developments in Sterling engine systems are becoming available. For example a 55 kWe Sterling cycle system has achieved 31% electrical efficiency and 80% total efficiency (2). Sterling cycle engines, which use external combustion, are suitable for direct use of wood and agricultural residue fuels.

■ *SPONSOR A 160 ACRE TREE FARM*
One of the barriers to widespread utilization of dedicated energy crops is the perceived uncertainty regarding yields and costs. I believe that fast growing trees such as hybrid poplar and cottonwoods are the best biomass crop for Wisconsin. Dedicated tree crops can be expected to yield 25 dry tons/acre after 5 growing seasons in Wisconsin. Using the planting, growing, and harvesting techniques that are under development we believe that dedicated tree crops can be delivered at $2.80/million Btu ($2003) to a power plant site or biorefinery within 50 miles (3).

Before investing in thousands of acres of these fast growing trees, investors such as utilities and banks need to more verification of the yield and costs. The Department should sponsor a 160 acre demonstration hybrid poplar and cottonwood tree farm where the trees are grown on 6 ft centers and harvested after five years. The wood could be sold

after five to recover much of the cost of the project.

BENEFITS TO RURAL WISCONSIN

Biopower and biorefineries will provide jobs in rural areas. For example, providing farm-grown fuel for a 100 MW power plant would provide 4-8 fulltime jobs in tree farm management, 20-36 seasonal jobs in planting operations, 8-12 fulltime jobs operating harvesting equipment, and 16-24 fulltime jobs operating wood hauling trucks. Power plant operations would require 20-30 fulltime personnel. Power producers would sign long term agreements with farmers to grow trees or to lease the farmland in 80 acres parcels or more, thereby providing steady income for the farmer. Land rent for the tree farms would provide roughly $6-9 million annually to the local economy (4).

Growing trees on former cropland has several environmental benefits including carbon sequestration, creation of wildlife habitat, soil quality improvement, and reduced chemical input relative to annual crops. Fast growing trees sequester 40% of their biomass in root growth. Carbon dioxide and water from the atmosphere form 99% of the biomass and the inorganic matter from the soil is less than 1% of the biomass. Ash from the power plant is collected, pelletized and returned to the soil as a slow release fertilizer. Since the flue gas contains essentially no sulfuric acid, the flue gas may be condensed to recover extra heat to dry the fuel, preheat the combustion air and increase the overall efficiency of power generation.

REMARKS ON POWER PLANT TECHNOLOGY

Wood crops can be used as a fuel for various types of boilers for utility power plants including direct firing and gasification using fixed beds, fluidized beds and whole tree burners for condensing and cogeneration power plants. Heat rates of 10,500 Btu/kWh are possible today. Power plant efficiencies up to 40% with biomass (heat rate of 8532 Btu/kWh) will be possible in the near future (5). At this heat rate and an improved yield of 30 dry tons/acre after 5 growing seasons, a 100 MW power plant would require 43,000 acres, or a 33% decrease in the amount of farmland needed compared to current technology.

Improved power plant efficiency can be achieved in several ways. The steam cycle efficiency can be improved by increasing the steam pressure and temperature. Recently new coal fired power plants have demonstrated efficiencies above 40% (based on the higher heating value). A similar approach can be used in a wood fired power plant and also using heat recovered by condensing the flue gas. Natural gas fired combined steam turbine/gas turbine power plants approach 60% efficiency. Coal and biomass fired combined cycle power plants have not achieved this level of efficiency due to the losses associated with controlling erosion, corrosion, and deposition of particulate, alkali and tars on the gas turbine blades, but 40% efficiency may be doable for combined cycles.

Older wood fired boilers using green woodchips on grates and operating at 20% efficiency should not be the model used by decision makers. New technology such as fluidized bed technology and deep fixed bed whole tree energy technology using preheated air and dried wood with heat obtained by condensing the flue gas is the way to

higher efficiency.

References:

(1) 2002 Census of Agriculture-Wisconsin, Volume 1, Chapter 1, Table 1; Wisconsin Agricultural Service.
(2) STM Power, Inc, Ann Arbor, MI; see www.stmpower.com
(3) Based on the experience of Energy Performance Systems, Inc. with machine planting and harvesting of MN6 hybrid poplar trees in southern Minnesota.
(4) "Economic and Technical Feasibility of Modifying the Minnesota Valley Power Plant to Utilize Whole Trees as the Primary Fuel Source," report to Xcel Energy by Energy Performance Systems, Inc., May 2003.
(5) "Supercritical Power Plants Hike Efficiency, Gain World Market Share," Gorokhov, V., Ramezan, M., Power Engineering, 00325961, Oct99, Vol. 103, Issue 10.

Thank you for the opportunity of submit these comments for your consideration. Please contact me if I can be of assistance.

Kenneth W. Ragland
Vice President of Engineering, Energy Performance Systems, Inc.
Emeritus Professor of Mechanical Engineering, UW-Madison

Due to prior commitments, I will not be able attend any of the hearings tomorrow, so I am submitting my comments this way. Please take these comments under consideration. It is very clear that we are at a crossroads in this country and in our State. Our society is utterly dependant of energy to function in a manner that we have become accustomed to. The facts show that our traditional energy sources are becoming depleted, especially on our continent. We have become dependant on foreign sources, and the competition for those resources is becoming intense. Add to that the fact that using fossil fuels is seriously harming our environment. To insure survival of our society we must use our remaining fossil fuel resources as efficiently as possible while fast tracking a switch to renewable energy sources. This should be the HIGHEST priority of our government. It is critically important! Our State created the Public Benefits Program to address this issue several years ago. This innovative program has proven incredibly successful and efficient delivering 570% return on money spent. The program does not impact the state budget, is staffed by a highly qualified group of professionals, and is gaining the confidence of businesses and individuals throughout the State. Unfortunately, the fund that supports this program has been robbed in a shortsighted effort to fix State budget shortfalls. I recommend the Governor restore full funding to this extremely important program. In fact, I suggest the highly successful program be expanded, because if we don't, our economy may collapse. Our State Government must lead the way by becoming more efficient in it's use of energy and must lead the way in utilizing renewable energy. We must increase the renewable energy standard immediately and take advantage of every energy conservation measure available to us. The money spent on this effort will reap huge benefits to our State economy in both the short run and especially in the long run. The State can also lead and encourage the use of renewable energy by exempting renewable energy systems from sales tax. It is unfortunate that the State Government so often looks at the short term to the detriment of the long term. In this case, the survival of our State economy depends on our making these changes. Government should be the mechanism that looks after the welfare of its citizens. That is what government should be all about. The above-mentioned issues should be among the highest priorities of our government. Don't let us down again.

Sincerely,
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BEFORE THE WISCONSIN GOVERNOR'S TASK FORCE ON

ENERGY EFFICIENCY AND RENEWABLE ENERGY

PUBLIC COMMENTS BY ELIZABETH RICH

Executive Director of E4, Inc.

June 15, 2004

My name is Elizabeth Rich. I am the Executive Director of E4, a non-profit organization dedicated to the environmental and economic benefits of energy efficiency for Wisconsin businesses. I am testifying today on the role of energy efficiency in Wisconsin's energy future. Specifically, I will address three issues that merit the Task Force's close attention and action:

(1) The scope of the pending study of energy efficiency in Wisconsin commissioned by the Task Force;
(2) Compliance with Wisconsin's Energy Priorities Law; and
(3) The need for developing an alternative energy portfolio standard that includes not only renewable energy sources, but energy efficiency technology as well.

As an attorney who has practiced environmental law in Wisconsin for over 20 years, I am concerned by what I see. Throughout my legal career, Wisconsin has been a leader in developing sound, innovative energy policies. Few would contest the notion that we no longer hold that position of leadership. And unless the Task Force resists pressure to significantly dilute the Energy Priorities Law, we will take a giant step backward.

Many recent studies conducted as part of the permitting process for new power plants in Wisconsin have relied on energy efficiency data that is more than 10 years out of date. Not surprisingly, based on that data, the studies have concluded that very little energy demand reduction is available in the commercial and industrial sectors.

The Task Force, to its credit, has commissioned the Energy Center of Wisconsin to undertake a study of energy efficiency potential in the State. We now have the opportunity to remedy our failure to identify the true potential that energy efficiency provides. A recent study by the American Council for an Energy Efficient Economy suggested that, nationwide, we have the potential to reduce industrial energy consumption by 20%. Certainly, an accurate picture of the opportunities for energy efficiency in Wisconsin must include the industrial sector's energy efficiency potential.

Wisconsin's Energy Priorities Law, set forth at Section 1.12 (4) of the Wisconsin Statutes, requires the Public Service Commission to give energy efficiency first priority over all other methods for meeting energy demands. That means first priority over coal, first priority over natural gas, and first priority over renewable energy sources. We need to take a very close look at

whether the PSC has met those requirements. The answer, of course, is that it has not.

Perhaps the most critical issue facing the Task Force is how that non-compliance will be addressed. Continued violation of the law is not a viable option. Equally untenable, however, is the notion that the law should be watered down in order to make compliance with it easier. Doing so would only place Wisconsin even further behind the rest of the nation in energy efficiency policy implementation.

The Energy Priorities law was enacted to ensure that the PSC and the utilities consider all opportunities for energy efficiency and renewable energy sources before constructing any new power plants. That goal may not be realized if the Priorities law is not given a prominent place in the PSC docket for construction of new power plants.

If dilution of the Energy Priorities law is not the answer, what is? E4 suggests that an alternative energy portfolio standard would represent a significant step forward in addressing this problem. Energy efficiency is the cleanest and most cost-effective way to create new electrical supply. It does not require transmission lines or expensive infrastructure. We suggest the PSC adopt a portfolio approach to energy efficiency and demand reduction similar to that already in place for renewables. The PSC would require measurable, verifiable demand reduction at specified levels as a pre-condition to construction of new power plants.

In short, we have three messages for the Task Force:

- We need a focused, comprehensive study of the potential for energy demand reduction in Wisconsin's commercial and industrial sectors.
- We need to fix what is broken, not lower our standards to make what is broken acceptable. That means that dilution of the Energy Priorities Law is not something the Task Force should consider.
- We need to once again take the lead in development of innovative energy policy by implementing an energy efficiency portfolio standard.

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June 15, 2004

To: Governor's Energy Task Force

(Unfortunately, prior commitments prevent me from presenting my comments to the Governor's Energy Task Force in person. Please accept my testimony as written comment.)

Thank you for the opportunity to address the Governor's Energy Task Force. I would like to make three points:

1. During last year's budget negotiations, Governor Doyle proposed cutting the Focus on Energy program by $27 million to help balance the budget. The Legislature, in their political wisdom, saw the Governor's bid and raised the ante an additional $20 million. Governor Doyle, who campaigned on a platform supporting the Focus on Energy's renewables and energy efficiency programs, let the entire $47 million in cuts stand.

This diverting of one third of the funding for Focus on Energy is unacceptable for several reasons. First, Focus on Energy funding comes from an assessment on utility ratepayers. It is not a tax. Absconding Focus on Energy money for the state general fund is illegal as well as inappropriate.

Second, the Focus on Energy program is one of the few state programs that has been deemed a resounding success. Independent evaluations of the program reveal a $5.70 return on investment for every $1 of ratepayers' money spent.

Third, slashing Focus on Energy funding at the very time that Wisconsin faces proposals for the largest increases in transmission and power plant expansion and construction in the history of the state is short sighted, to say the least. It calls into question not only the Governor's and the legislature's commitment to using dollars wisely but also their vision of where Wisconsin is headed. These cuts clearly show that our government does not have a clear and consistent energy policy, regardless of established state statutes dictating electrical reliability and prioritizing sources of new electrical capacity.

The Focus on Energy funding problem must be fixed. I urge you to strongly recommend restoring Focus on Energy funding to previous levels and taking it out of the reach of the Governor and the Legislature.

2. Generating electricity from the wind or livestock manure is considered by some to be small potatoes, intermittent, and not comparable to base load plants that burn coal or nuclear fuels, or peaking plants fired by natural gas. However, one critical point is skimmed over: Wisconsin does not have any fossil or nuclear sources of fuel. We import all of it, and it amounts to billions of dollars that leave the state annually.

But America's Dairyland does have it's share of manure. In addition, Wisconsin is ranked right behind California in the amount of potential wind capacity within the state. And the sun is democratic; everybody gets a share.

No one is talking about replacing our baseload electrical generating facilities with wind farms. But wind farms turn out to be remarkably compatible with, for example, gas fired peaking plants. In addition, renewable "fuels" such as wind power are coming in as the cheapest new capacity being proposed to utilities today, as recently revealed by WE Energy's CEO.

I urge the Task Force to raise the Renewable Energy Standard to at least 10% by no later than 2013.

3. Finally, the state has within it's power the ability to bolster renewable energy and energy efficiency markets through it's purchasing decisions by committing, for example, to purchase an escalating amount of electricity from renewable energy sources. Doing so would go a long way towards re-instilling confidence in the citizens of Wisconsin that our government officials are serious about the health, environment, and economy of our state.

Please lead Wisconsin by example and a long term vision.

Thank you for your time and consideration,

Mick Sagrillo

Mick Sagrillo

SOLAR MINING
company

The Value and Benefit of the Focus on Energy Program
The Inclusion of Solar Thermal Energy in the State Renewable Portfolio Standard
A review of its Effect on Solar Mining Company of Green Bay
June 14, 2004

In August 2003 Solar Mining Company of Green Bay applied for a grant from the Focus on Energy Program in order to explore the development of a new line of business. Prior to that time we had been exclusively involved in the development of solar energy products for use in the mining industry. This product line would not have ever been manufactured or used in Wisconsin. We were encouraged by the staff at the Focus office to apply for a grant to see if it was feasible to develop a market for other types of solar thermal energy products in the state.

We have always been aware of this market and felt that we had a novel approach but were not inclined to risk entering a new line of business at the time. Our concept was to develop a unregulated utility that would construct solar thermal energy systems on a company's or institution's property for no charge to the end user, then sell the energy produced by the systems to the end user for a discount to what ever they would be paying for the equivalent energy from the utility. This is primarily natural gas.
Upon receipt of the grant, $ 10,000, we hired a person, said to them that they had a budget of $ 30,000 to explore, evaluate and develop a marketing plan for a solar thermal utility and if they could do that then they could keep the job and we would move forward. Our contribution was certainly greater then the money received from the Focus program, but the receipt of the grant also indicated to us that others, outside of our company, had looked at our concept and decided that it had merit and a chance for success, otherwise they would not have awarded us the grant. Sometimes one is unwilling to move in new directions without outside validation, and the receipt of the grant demonstrated that we had not just talked ourselves into a new business line.

The $ 10,000 grant and subsequent grants of $ 80,000 has now turned into a business with 15 new employees, 10 of which were not working at the time of our hiring them. This has generated a payroll that has over $ 20,000 in withholding taxes being sent to the state in the last year. It has allowed us to occupy a world class manufacturing facility in Green Bay that had been empty for over a year when other manufacturing jobs were lost. It has generated over a $ 1,500,000 in direct investment and business activity. It will also result over the life of the systems that have been installed, over $ 2,000,000 in energy payments that will stay in the state rather then go to natural gas producers in other states or countries. These numbers are only a reflection of the current status and are not indicative of what we hope to do in the future.

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In our opinion it is hard to imagine that the Focus on Energy Program is even considered for further cuts rather than a substantial expansion. While we will concede that some money dispensed by the Focus program will not have the results that we have had, that is more a function of the intent of the applicants. We wanted to create a new industry and most applicants are project specific. From our own experience virtually all projects funded by the Focus program can create far more value for the state in terms of income tax, sales tax or retention of energy payments within the state than will be paid out by the program. For those who are concerned about the state, it's welfare and the ability to create jobs, there are few industries that do a better job of that than renewable energy or conservation industries since these activities can only take place within the state, and have no possibility of ever being outsourced.

The case for inclusion of solar thermal in the Renewable Portfolio Standard is both practical and economically viable. Traditionally, only electrical generation technologies have been included in these Portfolios, but from a practical and economical point of view Solar Thermal Energy Technologies should also be place upon the same footing as the others. The primary reasons for this are:

- The stated goals of any renewable standard is to reduce the dependency on fossil fuel derived energy, solar thermal meets that goal.
- Portfolio standards are evaluated as avoided combustion with no distinction made between the use of natural gas or coal, solar thermal technologies displace primarily natural gas. Avoided combustion is avoided combustion whether or not the end product is electricity or heat.
- Solar thermal energy is much closer to being economically viable in the energy market place then either wind or photovolatics and thus easier to place in the market.

Beyond the above arguments the inclusion of solar thermal energy in the Portfolio Standards would have a much greater positive impact on the state and it's economy than any other known renewable energy technology. The basic facts are:

- Solar thermal is strictly a locally deployed technology. Electricity generated by PV or wind can be produced anywhere and through the financial attributes that can be associated with them through green tags and other energy consumption programs they can produce their power in other states, while not having any local effect other then being used to meet the standards. They may not create any energy or jobs within the state.
- Each square foot of solar thermal collector deployed within the state will generate a direct economic benefit of $ 35 to $ 45/sq.ft. in labor and materials within the state. This will also prevent the export of a minimum of $ 60.00 in energy payments to natural gas producers outside of the states borders.

- Every 1000 square feet of solar thermal collector deployed within the state each year creates one job in Wisconsin. This job cannot be created anywhere else or moved to any other state. As the number of square feet increases the number of jobs per square foot of installed collector will actually increase due to the greater amount of local support required to meet the volume. These jobs come from suppliers and other manufacturers.
- Inclusion of solar thermal in the standards will also allow Wisconsin companies to attract green tag monies from other states thus setting up a scenario whereby the citizens of Wisconsin can have their energy needs subsidized by persons and companies outside of the state.

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June 15, 2004

Governor's Task Force on Energy Efficiency & Renewables

To the Task Force,

I am here today to represent two institutions that have a critical role to play in the future environmental quality and economic competitiveness of Wisconsin; the School of Architecture and Urban Planning at the University of Wisconsin-Milwaukee, where I am an associate professor of architecture, and the Wisconsin Green Building Alliance, of which I am a founding member and the current board president.

Both institutions are strong advocates for progressive design practices aimed at conserving Wisconsin's natural resources, protecting the health of its people and ecosystems, and increasing its economic efficiency. Both institutions depend on public commitment to the environment in order function in this capacity, and when that public commitment fails, our ability to advance these goals through either institution falls apart. On behalf of both the School of Architecture and Urban Planning and the Wisconsin Green Building Alliance, I implore you to take a strong stand to protect Wisconsin's Focus on Energy Program; Wisconsin's public commitment to doing right by the energy that we consume. This program demands and deserves the secure funding that the source of the funds implies.

I'm sure that many other Focus on Energy partners will speak forcefully about the efficacy of the program and its immediate and tangible benefits. I would like to elaborate on my plea by having you consider the significance of the Focus on Energy Program in supporting academic initiatives, and the importance of educating students of architecture about environmentally responsible design for the future health of our State.

Thanks to a grant from the Wisconsin Environmental Education Board underwritten by Focus on Energy, the Dept. of Architecture has been able to purchase an infrared imaging camera for teaching about heat flow in buildings by direct experience. Nothing could be more revolutionary in the classroom than to be able to literally 'see' the phenomenon of heat transfer for the first time. The abstract concern for saving energy suddenly becomes concrete, and students understand Wisconsin's climate like never before. Unfortunately for other educational institutions, this grant program has now been eliminated.

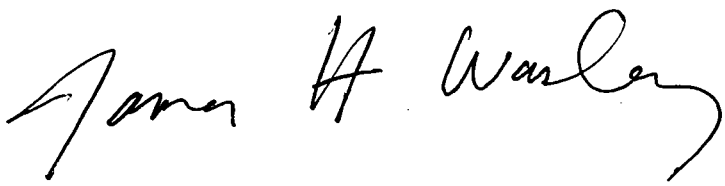
Thanks to critical support from Focus on Energy over the last several years, the Wisconsin Green Building Alliance has been able to host multiple conferences and events that have brought international expertise through Wisconsin. WGBA has also been able to involve students from UWM and other institutions in hosting these visitors and learning from their examples. WGBA has leveraged its local support to put Wisconsin on the national stage by becoming an Affiliate of the United States Green Building Council, and now students from UWM are a driving force in opening up the national 'green building' movement to student participation. Ultimately, the connections that these students are making will make them more competitive nationally, just as WGBA's work to make Wisconsin more competitive will continue to provide them incentives to stay and develop their careers in Wisconsin.

And thanks to small but strategically important gestures, Focus on Energy has played a key role in developing a funding base for two symposia offered over the last two years on 'Greening the UW System Campuses.' These statewide events have promoted improvements to the physical infrastructure of Wisconsin campuses. They have also brought to light the national movement to integrate the environmental concerns embodied in these improvements into the curricula. Considering that the UW Madison campus alone is responsible for over 40% of the State's energy bill, and that students are the most potent force for positive change on any campus, the long-term significance of educating them to their own responsibilities and opportunities is immense.

These are just a few examples of the positive impact that the Focus on Energy Program has had on the education of Wisconsin's future architects, as well as on the education through WGBA of its existing stock of practitioners. As someone whose chosen role is to serve as a conduit between the worlds of the student and of the profession, I would urge this Task Force to take the long view in their deliberations. Please do not allow the institutional structures that the Focus on Energy Program has begun to foster to be undermined and washed away. Stand up for the principle that this tax on environmentally destructive behavior exists to promote environmentally beneficial change. Stand up for the commitment to the long-haul required for real change to take root.

Thank you.

Sincerely,



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Advanced Renewable Tariffs & Electricity Feed Laws

by Paul Gipe*

Since 1991 when Germany introduced its ground-breaking Electricity Feed Law, the country has installed more than 14,000 MW of wind generating capacity--more than twice that installed in the United States. One-third of all German wind capacity, about $7 billion CAD, is owned by farmers, households, small businesses, and co-operatives. Spain, France, and a host of other countries have followed Germany's example and introduced similar Feed Laws. This has resulted in the spectacular growth of wind energy in Europe. Spain now ranks second in installed wind capacity worldwide, surpassing that in the United States in 2002.

In 1999, the German parliament amended the Electricity Feed Law and updated it for the new millennium. The Renewable Energy Sources Act covered additional technologies and introduced a multi-tiered system for determining the price paid for renewable sources of electricity. The French government followed the German example and introduced what it called Advanced Renewable Tariffs.

What Are Advanced Renewable Tariffs?

Advanced Renewable Tariffs permit the interconnection of renewable sources of electricity with the grid and specify the price paid for the electricity generated.

How Do They Work?

Via a public policy debate, society (a state assembly, congress, or parliament) determines a rate to be paid for every kilowatt-hour (kWh) generated by a renewable source of energy. This rate varies from one form of renewable energy to another.

How Are Prices Determined?

The payment for wind energy in the original German Electricity Feed Law was simply 90% of the retail tariff. In Advanced Renewable Tariffs, economists and engineers use a more complex approach, calculating the prices per kWh needed for various technologies to produce a profit under varying conditions. They then report their findings to a legislative assembly, where the final price is determined by a transparent political process. In this manner prices can be tailored to technologies, regions, and sectors of the economy.

For wind energy in Germany and France, Advanced Renewable Tariffs specify payments in several tranches: one price during an initial period to recoup the turbine's capital cost, and multiple prices in a subsequent period based upon the productivity of the wind turbine. In the second period, higher prices are paid for wind turbines that are less productive than a "reference" turbine, lower prices for turbines that are more productive. This is to encourage installation of wind turbines across the countryside instead of concentrating them only in areas with the highest winds.

France sets three different tiers and different prices depending upon location: metropolitan France or its former colonies. The overseas departments and territories and Corsica are paid more than mainland France.

Germany's Advanced Renewable Tariffs set two tiers that apply across the entire country. In Germany, the fixed price for new installations gradually declines every year. Further, the prices are revisited by parliament (the Bundestag) every two years. This provision encourages economic efficiency and allows for tailoring the program to changes in the economy.

What are the Advanced Renewable Tariffs in Europe?

Wind Energy

- Germany paid $0.15 CAD/kWh during the first five years of operation (base year 2002). During the following 15 years, Germany will pay $0.10 CAD/kWh at windy sites, and $0.14 CAD/kWh at the less windy reference site.
- France pays $0.14 CAD/kWh during the first five years of operation for projects less than 12 MW. During the following 15 years, France will pay as little as $0.05 CAD/kWh for windy sites, and as much as $0.14 CAD/kWh at less windy sites. Wind turbines at sites between these two extremes will be paid $0.10 CAD/kWh.
- Spain pays $0.10 CAD/kWh for projects less than 50 MW. Developers may also choose a premium of $0.05 CAD/kWh above the wholesale or market price. Most have chosen the fixed

price.
- Austria pays $0.13 CAD/kWh for wind-generated electricity under its new Electricity Feed Law.

Photovoltaics

- Germany pays $0.83 CAD/kWh for projects less than 5 kW.
- Spain pays $0.67 CAD/kWh for projects less than 5 kW, $0.33 CAD/kWh for projects less than 25 MW.
- France pays $0.25 CAD/kWh on the mainland, $0.51 CAD/kWh in its overseas territories.

How Do Advanced Renewable Tariffs Differ from Net-Metering?

Net-metering is often limited both in the size of renewable systems used (often only 10 kW) and in the total amount of capacity permitted on the system. Moreover, net-metering by definition does not include surplus generation or electricity delivered to the grid in excess of customer demand. Advanced Renewable Tariffs permit ratepayers, for example, to install the most cost-effective wind turbine for their application. Under net-metering, no customer can justify producing excess generation which is effectively delivered to the grid gratis. This effectively limits the size of the wind turbine to that which is less than economically optimum.

How Do Advanced Renewable Tariffs Relate to Renewable Portfolio Standards?

Renewable Portfolio Standards (RPS) are simply targets, for example 10% of electricity supply from renewables by a certain date. Renewable Portfolio Standards do not specify how to arrive at such a target. Many mistakenly assume that to meet RPS targets, bidding is required. Bidding is only one way to meet RPS targets, Advanced Renewable Tariffs are another.

Bidding is cumbersome, legalistic, and often excludes community participation. Because of the sophisticated gaming strategies used by bidders, there are heavy up-front legal and engineering costs associated with bidding. These up-front costs deter individual farmers, as well as community groups, from participating in bidding. This leads to further concentration of renewables in the hands of the power generators.

The most egalitarian mechanism for quickly bringing the most new renewables on line is Advanced Renewable Tariffs.

Have Advanced Renewable Tariffs Been

Used Before in North America?

Much of the wind-generating capacity operating today in California was installed under a program quite similar to Advanced Renewable Tariffs. In the early 1980s, the California Public Utility Commission introduced what were then called Standard Offer #4 contracts. These contracts guaranteed a pre-determined price for a period of ten years. Unlike modern Advanced Renewable Tariffs, the price under these contracts increased gradually during the period they were in effect. Nearly 1,500 MW of the 2,000 MW currently operating in California today were installed under this program and launched the world's commercial wind industry.

Who Pays the Difference?

Society--federal or provincial taxpayers, or ratepayers--makes up the difference between the so-called wholesale market price and the fixed tariff.

Who Should Qualify?

For maximum rural economic benefit, premium payments under Advanced Renewable Tariffs should be limited to farmers, co-operatives, or other small holders. Power generators should be excluded.

Why Now?

Energy is politically in play and the deregulation fiasco opens the door to innovative proposals.

Where are Advanced Renewable Tariffs Being Used?

Germany, Spain, France, Austria, and Portugal now have Electricity Feed Laws. In Spain, wind developers can opt for either a fixed payment or take the market price. All have chosen the fixed price and as a result, Spain has become the world's largest wind market outside Germany.

More information on Feed Laws and Advanced Renewable Tariffs

For more information on Electricity Feed Laws and Advanced Renewable Tariffs, point your browser to www.wind-works.org/articles/feed_laws.html.

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